The impact of personal and social comparison information about health risk

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Objectives: To examine the emotional and cognitive impact of personal and social comparison information about health risk.

Methods: A total of 970 adults responded to vignettes describing risk presentation scenarios that varied in terms of having (a) a ‘real world’ analogue (cardiac event) versus no such analogue (a fictitious pancreatic disease) condition, (b) high versus low levels of personal risk, and (c) no comparison group information given, comparison group risk higher or lower than own risk.

Results: For both the cardiac and pancreatic disease vignettes, respondents’ emotional responses and estimates of their own risk were influenced by both personal and social comparison risk information. The cardiac event vignettes produced larger effects than the pancreatic disease vignettes. Unfavourable social comparison information had no discernible impact, relative to not providing any social comparison information. Favourable social comparison information resulted in greater reassurance, less worry, and perceptions of lower susceptibility. Lower personal risk generally produced similar effects, relative to higher personal risk.

Conclusions: In contrast to previous theory and research in this area, we found that both personal and (favourable) social comparison risk information have emotional and cognitive consequences. We hypothesize that the perceived clarity of the information may account for the different patterns of findings in the literature.

When asked to make judgments about ourselves or the external world, we frequently compare ourselves with others. This observation stems from experimental work dating back to Sherif (1936). A central hypothesis of Festinger was that people use social comparison information only to the extent that objective personal information is not available: ‘when an objective non-social basis for the evaluation of one’s ability or opinion is readily available persons will not evaluate their opinions or abilities by comparison with others’ (Festinger, 1954, p. 120). Knowing more about the precursors...
and consequences of these comparisons may be critical to understanding individuals’ cognitive and behavioural responses to health threats (Buunk, Gibbons, & Reis-Bergan, 1997; Tennen, McKee, & Affleck, 2000).

A series of studies reported by Klein (1997), involving the experimental manipulation of personal and social comparison information, tested Festinger’s hypothesis by allowing an assessment to be made of the relative impact of these two types of information. These studies generally showed that manipulations of social comparison risk information has a greater impact than personal risk information on a variety of outcomes including emotion, intentions and even behaviour, across several situations. In the first of Klein’s studies, hypothetical vignettes were used to present information about the likelihood of respondents, and their peer group, causing a car accident or developing pancreatic disease. For example, with the pancreatic disease vignette, respondents were instructed: ‘Imagine that you test positive on a salivary litmus test of a genetic marker for pancreatic disease.’ They were then told their personal risk (i.e. their own absolute risk), as well as the social comparison risk (i.e. the absolute risk of the average person of their age and sex). These risk figures varied according to experimental condition. They were asked to imagine how disturbed they would be about these results. In that study, personal risk information had no significant impact on outcomes at all. Thus, those asked to imagine a 60% chance of developing the disorder, compared with a chance of an average person of 80%, were less disturbed than someone told their chance was 30% when the average chance was 10%. These findings apparently are at odds with Festinger’s (1954) hypothesis, stating that social comparison information is used only to the extent that objective personal information is available.

Klein (1997) noted, however, that a similar, unpublished study concerning dietary fat intake (Raats & Sparks, 1995) produced results more consistent with Festinger’s hypothesis than with his own results: personal risk information, but not social comparison risk information, influenced ratings of disturbance. A subsequent study that used Klein’s (1997) pancreatic disease vignette found no significant main effects (Harris, Sparks, & Raats, 2002). It did, however, find a significant interaction between personal and social comparison risk information on ratings of disturbance, with social comparison information apparently having a larger effect with lower personal risk than with higher personal risk (Harris et al., 2002, Study 1). A third study, using the dietary fat intake with a sample of 100 students, found no significant effects (Harris et al., 2002, Study 2b).

Klein’s (1997) Study 3, which examined reactions to feedback about performance on an aesthetic judgment task, produced a further interesting finding. Although favourable social comparison information appeared to influence a variety of outcome variables relative to a control group that received no information, unfavourable social comparison information seemed to produce exactly the same impact as no information. This finding suggests that threat minimization processes may be operating, whereby people are motivated to deny the implications of unfavourable information (see Croyle, Sun, & Hart, 1997; Croyle, Sun, & Louie, 1993).

If Klein’s findings prove robust, they have important implications for the communication of risk information in clinical settings. Although it has repeatedly

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1 Klein referred to a presentation by Raats and Sparks (1995), the results of which have subsequently been published as Study 2a of Harris, Sparks, and Raats (2002).
been found that people are influenced by social comparison information (see Buunk & Gibbons, 1997), the finding that information about personal risk had no influence in the presence of information about one’s risk relative to others has potentially enormous consequences for the communication of risk information. It suggests that the communication of personal risk information is less influential than the communication of information about the degree of risk present, relative to a peer group. Furthermore, when people are informed that they are at higher risk than their peers, the implications of this information may be downplayed, reducing the perceived necessity of altering risk-related behaviours. Together, these phenomena would provide at least a partial explanation for the small effect that communication of personal risk information has been found to have on behaviour (van der Pligt, 1998). On the other hand, if Festinger’s (1954) position is correct, then the presentation of social comparison information will have minimal impact, if the personal risk information that is presented is unambiguous. Given that information on personal risk and the risk of comparison groups is now being presented in computerized form in clinical settings (e.g. Hingorani & Vallance, 1999), it is clearly important and timely to determine the extent to which Klein’s (1997) findings are robust.

There are grounds for doubting the generalizability of Klein’s (1997) findings, particularly with regard to the impact of communicating information about health risk. First of all, the vignettes that were used in his Study 1 involved hypothetical situations, and the test for a genetic marker of pancreatic disease was entirely fictitious. This use of a fictitious scenario removes the possibility of participants bringing ‘real world’ knowledge to their judgments, as they would when making such judgments in everyday life (Lalljee, 1981). Klein (1997) himself noted that the results of Raats and Sparks (1995) study have differed from his own because in the latter work personal risk information ‘was disambiguated by contextualizing it within recommendations given by health professionals’ (p. 772). A further limitation of Klein’s (1997) studies is that they all involved student samples. In addition to the usual doubts about the generalizability of research conducted with students (e.g. Sears, 1986), generalizability may be a particular problem with research on social comparison processes in health judgments, given that students are generally young and in good health.

It is also possible that Klein’s (1997) respondents may have had problems understanding and imagining the situations described in his pancreatic disease vignettes. We piloted the vignettes and response materials described by Klein with a sample or approximately 20 British MSc Health Psychology students in a group setting. Although they were able to provide apparently sensible responses, when we asked them for their views on the vignettes, a sizeable number indicated that they found the vignettes unclear for several reasons. First, respondents were unsure what a ‘salivary litmus test’ was. Secondly, they were unsure what the presence of a ‘genetic marker’ would imply. Thirdly, those respondents who were informed that they tested positive, but still had a risk lower than the average person of their age and sex, were puzzled by this apparent contradiction.

The main aim of the present study was to examine the impact of personal and social comparison information about health risk. As part of this, a secondary aim was to overcome the following problems with Klein’s pancreatic disease study. First, although some participants responded to vignettes describing the fictitious scenario concerning pancreatic disease, other participants responded to vignettes concerning cardiac events. Secondly, the respondents were adults between the ages of 40 and 60 years, who
constituted an appropriate sample for risk of cardiac events. Thirdly, the pancreatic
disease vignettes were re-written to increase clarity and coherence, while maintaining
similar conceptual content to those used by Klein (1997).

A further aim was to examine the effect of presenting this risk information using
different probability formats, and the presence or absence of format-congruent visual
representations.

**Presentation of risk information**

There is now a wealth of evidence that people find using information presented in
frequency format (e.g. 30 in 100) easier than using information presented in percentage
format (e.g. 30%), and make less biased judgments of risk when using information in
frequency format (reviewed by Gigerenzer, 2002). However, the majority of this
evidence is based on situations where respondents are asked to use this likelihood
information in a complex way. As a typical example, in one study physicians were given
information about the base rates of breast cancer, the probability of testing positive on a
mammogram in the presence of breast cancer, and the probability of testing positive in
the absence of breast cancer. They were then asked for the probability that a woman
who has a positive mammogram has breast cancer. Estimates were generally accurate
when the information was presented in frequency format, but often wildly inaccurate
when the information was presented in percentage format (Hoffrage & Gigerenzer,
1998). The current study aimed to investigate whether processing of simple likelihood
information would be affected by whether it is presented in frequency or probability
format.

In addition, there is an increasing trend in communicating health risks to employ a
visual representation of risk, rather than just a bald statement of the relevant frequencies
or percentages (Edwards, Elwyn, & Mulley, 2002). One popular format is the use of bar
charts to enhance the visual presentation of risks, which are currently being presented
on computers in clinical settings (Hingorani & Vallance, 1999). Analogue studies
suggest that visual representations influence perceptions of risk, but whether the
representations are visual, stick figures or asterisks appears to have little effect (Stone,
Yates, & Parker, 1997). However, bar charts are particularly congruent with a percentage
format of probability, and the icons are particularly congruent with a frequentist format
of probability. Consequently, previous studies may have underestimated the effects of
these visual representations if they were assessed with incongruent numerical/non-
visual likelihood information.

Consequently, the present study aimed to investigate not only whether processing of
personal and social comparison risk information is affected by whether this information
is presented in frequency or probability format, but also whether the use of a format-
congruent visual representation affected the impact of this information, in contrast to
no visual representation.

**Methods**

**Participants**

Participants were 970 adults recruited by a commercial survey organization from a
number of locations around Britain. In order to recruit a participant group that reflected
the population at risk of heart disease, the following criteria were used: 40–60 years of
age; equal numbers of men and women; and no history of heart disease. Of the participants, 52% were female (mean age = 49.0 yrs, SD = 6.7), and 48% were male (mean age = 49.1 yrs, SD = 6.5). All participants were literate, and a range of educational achievement was obtained. Of the respondents, 27% had no qualifications, 43% had some qualifications but no higher education, and 30% had at least some higher education.

**Design**

Pancreatic disease and coronary heart disease (CHD) vignettes were analysed separately. For each vignette, there was a $2 \times 3 \times 2 \times 2$ between-participants design, with four factors:

(a) level of personal risk;
(b) level of social comparison risk;
(c) frequency or percentage format; and
(d) format-congruent visual representation or no visual representation.

For each vignette, the level of personal risk was either high (60% for pancreatic disease; 10% for CHD) or low (30% for pancreatic disease; 2% for CHD), and the level of social comparison risk information was either higher (80% and 50% for pancreatic disease, 15% and 3% for CHD) or lower (40% and 10% for pancreatic disease, 5% and 1% for CHD) than the level of personal risk, or not given.

**Procedure**

Respondents were contacted from the listings of local recruitment agents of the commercial survey organization, and completed the questionnaire without supervision. In each location, questionnaires were distributed to respondents who fulfilled the recruitment criteria. The questionnaires were given to the commercial survey organization in a counterbalanced order to ensure that each recruitment agent received approximately equal numbers of questionnaires in each experimental condition, and to reduce the chances of there being a systematic relationship between the order in which local recruiters distributed the questionnaires and experimental condition. The study was presented as being conducted by researchers from a London teaching hospital, to find out how people understand risk information.

**Materials**

**Vignettes**

To overcome problems identified in our piloting, Klein’s (1997) pancreatic disease vignettes were re-written to contain essentially the same information, but to be more comprehensible, as follows:

Imagine that there is a genetic test that can tell you what your risk is of getting pancreatic disease in the future. The test involves having a blood sample that is then sent away for analysis. You have the test, and the results show that your risk of getting pancreatic disease is $x\% \text{ in the next 10 years.}$

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2 Men and women differed only in their reports of confidence that they understood the risk information they had been given, with men feeling more confident. As there were no other gender effects in the analyses reported, all analyses were collapsed across this variable.
This means that you stand a x% chance of getting pancreatic disease in the next 10 years.

On average, other people the same age and sex as you stand a y% chance of getting pancreatic disease in the next 10 years.*

Once you have **VIVIDLY IMAGINED** this situation, please complete the questions on the next few pages.

(* This sentence was omitted in the ‘no social comparison’ conditions.)

In parallel with the piloting of the pancreatic disease vignettes, CHD vignettes were also developed and piloted. The CHD vignettes were identical to the pancreatic disease, with the exception of the opening paragraph, as follows:

We would like you to **VIVIDLY IMAGINE** that you are at a consultation with your GP. You undergo a lot of tests, including an assessment of your diet, blood pressure, and smoking habits. On the basis of this, your GP tells you that your risk of having a cardiac event (such as a heart attack, angina, heart failure) is x% in the next 10 years.

**Dependent variables**

There were seven dependent variables, all measured on 10-point rating scales, numbered 1 - 10, with labels beneath the numbers 1, 4, 7 and 10. Respondents were asked the following questions (with labels):

- How disturbed would you be by these results? (‘not at all disturbed’, ‘somewhat disturbed’, ‘pretty disturbed’, ‘very disturbed’)*
- How reassured would you be by these results? (‘not at all reassured’, ‘somewhat reassured’, ‘pretty reassured’, ‘very reassured’)
- How worried would you be by these results? (‘not at all worried’, ‘somewhat worried’, ‘pretty worried’, ‘very worried’)
- Given the information you have received, how likely do you think you might be to have (this pancreatic disorder/a cardiac event) in the next 10 years? (‘certain’, ‘rather likely’, ‘rather unlikely’, ‘impossible’) **
- Given the information you have just received, how likely do you think an average person the same age and sex as you would be to have (this pancreatic disorder/a cardiac event) in the next ten years? (‘certain’, ‘rather likely’, ‘rather unlikely’, ‘impossible’) **
- How confident do you feel that you have understood the risk information you were given? (‘not at all confident’, ‘somewhat confident’, ‘pretty confident’, ‘very confident’)
- How familiar are you with (pancreatic disorders/cardiac events such as heart attacks, angina or heart failure)? (‘not at all familiar’, ‘somewhat familiar’, ‘pretty familiar’, ‘very familiar’) **

(* This item is identical to the one used by Klein (1997); ** depending on the disease mentioned in the vignette.)

**Results**

**Presentation of risk information**

A series of $2 \times 2 \times 2 \times 2$ between-participants ANOVAs were run separately for the pancreatic disease and CHD vignettes. The ‘no social comparison information’
conditions were not included in these analyses. Three dependent variables were examined:

(a) ratings of disturbed/worried;
(b) ratings of reassurance; and
(c) the likelihood of having the pancreatic disorder or a cardiac event.

As the items concerning how disturbed and worried respondents felt were very highly correlated in both the pancreatic disease and CHD vignettes (overall $r = 0.84$), they were aggregated to form a single scale. There was a main effect of whether a visual representation was included or not: for the CHD vignettes, those respondents who received a visual presentation gave lower ratings of being disturbed/worried, $F(1, 313) = 8.74, p < .01$ ($M = 9.37$) than those who did not receive a visual representation ($M = 10.98$). This main effect was not found for the ratings of being reassured, or for the pancreatic disease vignettes. There were no other main effects of either

(a) visual representation present versus absent, or
(b) frequency versus percentage format.

In the six analyses, five interaction effects were found involving one or both of these factors. None of these interactions was repeated in both pancreatic and CHD vignettes, with the same dependent variable. These six significant effects were found in 13 tests of main effects and interactions involving these variables, for each of six analyses (total 78 significance tests). Given that one would therefore expect to find approximately four such significant effects by chance alone, and that the effects were inconsistent and of small size (largest effect accounts for 3.1% of the variance), no further analysis is reported on these experimental factors.

**Personal versus social comparison risk information**

Mean responses to all items concerning how disturbed/worried and reassured respondents felt they would be, are presented in Table 1 for both pancreatic disease and CHD vignettes, along with perceptions of the likelihood of having the pancreatic disorder or a cardiac event. The two right-hand columns contain the effect size estimates and significance tests from a series of between-participants ANCOVAs. The two independent variables are level of personal risk and level of social comparison risk, again excluding the ‘no social comparison information’ condition, and with the control variables of visual representation present versus absent and frequency versus percentage format All ANCOVAs were run separately for the pancreatic disease and CHD vignettes.

A comparison of the effect sizes reported in the last two columns of Table 1 shows that information on social comparison had more impact on responses than personal risk in only one case. For the item concerning the extent to which the information in the pancreatic disease vignette was perceived as reassuring, personal risk information had no significant effect. Moreover, there was a significant interaction present: the impact of social comparison information is much larger for low personal risk than for high personal risk.

In four of the six comparisons made, personal risk information had more impact on responses than social comparison information. It is noteworthy that for all three responses to the CHD vignette, personal risk information had more impact than social comparison risk information. It is also noteworthy that both types of risk information had more impact on responses to the CHD vignette than on responses to the pancreatic disease vignette.
Table 1. Mean (SD) responses on main dependent variables by experimental condition

<table>
<thead>
<tr>
<th></th>
<th>Personal risk</th>
<th>Comparison risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal risk</td>
<td>30% 10%</td>
<td>30% 10%</td>
</tr>
<tr>
<td>Comparison risk</td>
<td>60% 40%</td>
<td>60% 40%</td>
</tr>
<tr>
<td>How likely are you?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reassured</td>
<td>3.04 (2.06)</td>
<td>4.37 (2.41)</td>
</tr>
<tr>
<td>Disturbed + worried</td>
<td>12.31 (4.73)</td>
<td>9.91 (5.17)</td>
</tr>
<tr>
<td>How likely are you?</td>
<td>5.62 (1.57)</td>
<td>5.57 (1.57)</td>
</tr>
<tr>
<td>Coronary heart disease</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal risk</td>
<td>2% 1%</td>
<td>2% 1%</td>
</tr>
<tr>
<td>Comparison risk</td>
<td>10% 3%</td>
<td>10% 3%</td>
</tr>
<tr>
<td>How likely are you?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reassured</td>
<td>4.90 (2.23)</td>
<td>5.68 (2.63)</td>
</tr>
<tr>
<td>Disturbed + worried</td>
<td>9.57 (4.85)</td>
<td>7.67 (5.40)</td>
</tr>
<tr>
<td>How likely are you?</td>
<td>4.89 (1.67)</td>
<td>4.96 (1.76)</td>
</tr>
</tbody>
</table>

*p < .05; **p < .01; ***p < .001.

aScale: 1 (not at all) to 10 (very).
bScale (2 items): 2 (not at all) to 20 (very).
cScale: 1 (impossible) to 10 (certain).

The impact of providing no social comparison information

Table 2 presents mean ratings of four outcome variables, according to whether respondents were given unfavourable social comparison information (i.e. they were told their risk was above average), favourable social comparison information, or no social comparison information. One-way ANOVAs showed that the effects of social comparison information was significant in all analyses, hence differences between the three levels of the social comparison information factor were tested using Tukey’s post hoc honestly significant difference test.

For all variables in both vignettes, it can be seen that the impact of unfavourable social comparison information did not differ from providing no social comparison information. For the pancreatic disease vignettes, those respondents who were given favourable social comparison information differed significantly from respondents in the other two conditions: those given favourable information were more reassured, less disturbed/worried, and rated the average person as more likely to suffer pancreatic disease. For the CHD vignettes, those respondents who were given favourable social comparison information were significantly less disturbed/worried than respondents in the other two conditions. Those respondents who were given favourable information were also significantly more reassured and thought they were less likely to have a cardiac event than were respondents who were given unfavourable information.
Differences in the pattern of responses to the CHD and pancreatic disease vignettes were quite consistent. As there were many differences between the two sets of vignettes, no formal inferential statistics were calculated. However, from examination of the ratings shown in Table 1, it can be seen that in all six experimental conditions, respondents indicated higher levels of being disturbed/worried for the pancreatic disease vignette than for the CHD vignette. For five of the six conditions, respondents also indicated that they would be more reassured by the information contained in the CHD vignette, and rated themselves as less likely to have a cardiac event than suffer pancreatic disease.

Table 2. Mean (SD) responses according to social comparison information condition

<table>
<thead>
<tr>
<th></th>
<th>Unfavourable social comparison information</th>
<th>No social comparison information</th>
<th>Favourable social comparison information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pancreatic disease</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reassured</td>
<td>3.43x (2.25)</td>
<td>3.42x (2.32)</td>
<td>4.10x (2.50)</td>
</tr>
<tr>
<td>Disturbed + worried	extsuperscript{b}</td>
<td>12.80x (4.91)</td>
<td>12.84x (4.83)</td>
<td>11.12x (5.36)</td>
</tr>
<tr>
<td>How likely are you?\textsuperscript{c}</td>
<td>5.91 (1.62)</td>
<td>5.97 (1.56)</td>
<td>5.71 (1.62)</td>
</tr>
<tr>
<td>How likely is the average person?\textsuperscript{c}</td>
<td>5.19x (1.41)</td>
<td>5.48x (1.53)</td>
<td>6.25x (1.43)</td>
</tr>
<tr>
<td><strong>Coronary heart disease</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reassured</td>
<td>3.98x (2.32)</td>
<td>4.57 (2.47)</td>
<td>5.19x (2.60)</td>
</tr>
<tr>
<td>Disturbed + worried\textsuperscript{b}</td>
<td>11.32x (4.93)</td>
<td>10.40x (5.51)</td>
<td>8.97x (5.51)</td>
</tr>
<tr>
<td>How likely are you?\textsuperscript{c}</td>
<td>5.55x (1.72)</td>
<td>5.30 (1.71)</td>
<td>4.94x (1.81)</td>
</tr>
<tr>
<td>How likely is the average person?\textsuperscript{c}</td>
<td>5.19 (1.71)</td>
<td>5.34 (1.40)</td>
<td>5.38 (1.52)</td>
</tr>
</tbody>
</table>

Note: Means in the same row having different subscripts differ significantly at \( p < .05 \) in the Tukey honestly significant difference comparison.

\textsuperscript{a} Scale: 1 (not at all) to 10 (very).

\textsuperscript{b} Scale (2 items): 2 (not at all) to 20 (very).

\textsuperscript{c} Scale: 1 (impossible) to 10 (certain).

**Comparison of CHD and pancreatic disease vignettes**

Differences in the pattern of responses to the CHD and pancreatic disease vignettes were quite consistent. As there were many differences between the two sets of vignettes, no formal inferential statistics were calculated. However, from examination of the ratings shown in Table 1, it can be seen that in all six experimental conditions, respondents indicated higher levels of being disturbed/worried for the pancreatic disease vignette than for the CHD vignette. For five of the six conditions, respondents also indicated that they would be more reassured by the information contained in the CHD vignette, and rated themselves as less likely to have a cardiac event than suffer pancreatic disease.

The other major differences between the responses to the two vignettes concerned the perceived familiarity with the disease concerned, and perceived understanding of the vignettes. Ratings of familiarity with the disease mentioned in the vignettes were higher for those respondents who completed the CHD vignettes \( (M = 4.60, SD = 2.46) \) than for those respondents who completed the pancreatic disease vignettes \( (M = 2.53, SD = 2.04) \); \( t(1,946) = 14.11, p < .001 \). Respondents who completed the CHD vignettes \( (M = 5.51, SD = 2.42) \) were more confident, \( t(1,945) = 2.08, p < .05 \), that they understood the information they had been given than were respondents who completed the pancreatic disease vignettes \( (M = 5.17, SD = 2.54) \).

For the pancreatic disease vignettes, respondents’ ratings of confidence that they understood the information they had been given did not moderate the influence of either personal risk information or social comparison risk information on the disturbed/worried scale. However, for the CHD vignettes, respondent ratings of confidence that they understood the information they had been given did have significant moderating effects for both personal and social comparison information.
moderation analyses were conducted using regression with product terms, as recommended by Cohen and Cohen (1983, pp. 311-320).

The interaction between level of personal risk information and ratings of confidence added a significant amount of variance to the prediction of the disturbed/worried scale, $F_{\text{change}}(1, 473) = 5.32, \Delta R^2 = .010, p < .05$. The more confident respondents felt that they understood the information they had been given, the more impact personal risk information had on disturbance/worry. For example, the correlation between personal risk information and disturbance/worry was only $r = 0.19$ for the least confident half of the respondents, but was $r = 0.36$ for the most confident half of the respondents.

Similarly, the interaction between level of social comparison information and ratings of confidence also added a significant amount of variance to the prediction of the disturbed/worried scale, $F_{\text{change}}(1, 312) = 14.91, \Delta R^2 = .133, p < .001$. The more confident respondents felt that they understood the information they had been given, the more impact social comparison information had on disturbance/worry. These effects were quite strong: the correlation between social comparison information and disturbance/worry was only $r = 0.06$ for the least confident half of the respondents, but was $r = .36$ for the most confident half of the respondents.

**Discussion**

These findings demonstrate that both personal risk information and information about the risk of a peer group can influence individuals' cognitive and emotional responses to risk information. This generally held true for both genetic risk in a fictitious pancreatic disease scenario, and integrated risk in a cardiac event scenario, and for both emotional responses and estimates of personal susceptibility. Information about the risk of a peer group was influential only if it was higher than personal risk; individuals indicated they were reassured, less disturbed or worried, and felt less susceptible in this context. Information about the risk of a peer group had no influence if it was lower than personal risk.

**Impact of presentation format**

The present study investigated the effect of probability information format with nearly 500 participants responding to vignettes about either CHD or pancreatic disease. Despite these sample sizes, we did not find any robust effects of either frequency versus probability representations, or the presence versus absence of visual representations of risk information. Evidence showing the superiority of frequency representations has come mainly from studies that asked respondents to perform complex numerical reasoning. The absence of any main effects in the present study suggests that there is little advantage to be gained from the presentation of probabilistic information in frequency format when the information communicated is simpler. Equally, we failed to find any robust effects of providing visual representations in addition to numerical risk information. Although some researchers have found evidence of an increase in understanding when visual representations are used (e.g. Stone et al., 1997), a recent review concluded that the evidence for a reliable effect was equivocal (Lipkus & Hollands, 1999). The null finding in the present study should be added to the weight of evidence considered in this review to question whether the recommendations to employ visual representations of risk (e.g. Edwards et al., 2002) should be implemented.
Impact of personal and social comparison information

Despite some minor differences in responses to the pancreatic disease and CHD vignettes, depending on which particular outcome measure used, the main finding of this study is that both personal risk information and social comparison risk information can have an impact on emotional responses and perceptions of risk. There was a slight tendency for personal risk information to have more impact than social comparison information, especially for the CHD vignettes, but this difference in impact was not large. A more consistent finding is that both types of risk information had more impact on responses to the CHD vignettes than on responses to the pancreatic disease vignettes.

These results are inconsistent with both Festinger’s (1954) original theory, and the more recent position of Klein (1997). Festinger took the viewpoint that in the presence of personal information, social comparison information would not be used. Our data, in common with Klein’s, clearly contradict this theory: social comparison information is used even in the presence of personal information. By contrast, Klein’s studies suggested that social comparison information had more impact than personal information across a range of situations, and more specifically that, in the area of risk, personal information had no effects. Our results suggest that both types of risk information have an impact, and that, if anything, personal risk information has the greater impact, provided such information is presented clearly.

The impact of favourable and unfavourable social comparison risk information

Considering the comparison between unfavourable social comparison information and no social comparison information, the two vignettes yielded similar findings: there were no significant differences on any of the four dependent measures in either vignette. One possible explanation is that if personal risk information is given in the absence of social comparison information, people may be more likely to assume that their own risk is higher than other people’s risk, thus engaging in an imaginary upward social comparison. Given the evidence that downward social comparison is most often used in judging performance, a more plausible explanation is that faced with unfavourable social comparison information, individuals engage in threat minimization, downplaying the significance of the information, a process for which there is considerable evidence (Croyle et al., 1997, 1993).

When the favourable comparison condition was considered, for both vignettes, those given favourable comparison information were significantly less disturbed/worried than respondents in the unfavourable comparison and no information conditions. For the pancreatic disease vignette, those respondents who were given favourable social comparison information were also more reassured, and rated the average person as more likely to suffer pancreatic disease. For the CHD vignettes, those respondents who were given favourable social comparison information were also significantly more reassured and thought they were less likely to have a cardiac event than were respondents who were given unfavourable information.

In summary, we found no evidence that providing unfavourable social comparison information had adverse effects. Providing favourable social comparison information has the potential to produce harmful and beneficial effects. It may be harmful if being less worried and more reassured impedes any recommended behaviour change (Marteau, Kinmonth, Thompson, & Pyke, 1996). It may, however, be beneficial in attempts to reassure people who are inappropriately concerned about a relatively low level of risk.
Coronary heart disease verse pancreatic disease vignettes
It has already been noted that both types of risk information concerning cardiac events had more impact than risk information concerning pancreatic disease. The vignettes also differed in how familiar they were perceived to be, with CHD perceived to be more familiar. Ratings of understanding were also higher for the CHD vignettes, and furthermore, these ratings moderated the impact of both personal and social comparison information for the CHD vignettes only, with larger effect of both types of information being associated with higher ratings of understanding.

The above findings all suggest that the more concrete nature of CHD may have led to higher threat, and hence higher motivation to process both personal and social comparison information in these vignettes. There is evidence against such a viewpoint: ratings of both emotional responses to information, and personal susceptibility, were higher in most experimental conditions for the pancreatic disease vignettes than for the CHD vignettes. These contrasting findings are difficult to interpret, as there is a confound: the vignettes differed not only in disease, but also in the levels of the risk information provided. First, absolute levels were higher in pancreatic disease than CHD vignettes. Secondly, in the pancreatic disease vignettes, the two levels of personal risk information (i.e. 30% and 60%) differed by a factor of two and by an absolute difference of 30%, whereas for the CHD vignettes, the personal risk information (i.e. 2% and 10%) differed by a factor of five but by an absolute difference of 8%.

It is interesting that the only experimental condition where CHD vignettes elicited ratings of being less reassured and more highly susceptible than the pancreatic disease vignettes was where both described high absolute risk, with low peer group risk. Here, the CHD vignette described a situation where, although absolute risk was much lower (i.e. 10% vs. 60% for pancreatic disease vignette), relative risk was much higher (i.e. twice as high as peer group vs. only 50% higher). This finding suggests that the ratio of absolute to peer group risk may be as important as the absolute levels of either in isolation in determining the impact of risk communications. This information on relative risk has been shown in previous work to influence perceptions of benefits of treatment (Malenka, Baron, Johansen, Wahrenberger, & Ross, 1993) and the acceptability of treatment (Hux & Naylor, 1995). Further studies are needed to disentangle the effects of differing personal and social comparison risk information, individually as well as relative to each other. For example, it would be interesting to know how individuals would respond to a similar absolute difference in social comparison information, but different relative risk difference (e.g. 10% and 5%, compared with 15% and 10%).

Implications
Despite the conflicting findings of this study, some clarity emerges. It does seem that information about personal risk has an impact, provided it is presented clearly. It also seems likely that favourable but not unfavourable social comparison information has an impact on cognitive and emotional responses. Our results suggest that favourable social comparison will reassure, whereas unfavourable social comparison will not have any adverse emotional consequences. However, this study only looked at the cognitive and emotional consequences of presenting risk information, whereas there is a clear need to look at the behavioural consequences as well. Parallel process models (e.g. Leventhal et al., 1997) that can successfully account for much of the
data in this area (Witte & Allen, 2000) are based on the idea that information can have a differential impact on emotional and behavioural responses.

Comparison of the CHD and pancreatic disease vignettes suggests greater engagement with the CHD vignettes, possibly because CHD is a real disease. This comparison also suggests that not only are absolute and social comparison information important, but their levels relative to one another should also be considered. The moderating effect of understanding in the CHD vignettes also reinforces the idea that clearer, better understood information has more impact.

This summary of results suggests some consistent findings that have emerged from this literature, and some areas where further work is needed. It is also necessary for future research to examine whether these findings, developed in analogue studies, apply in settings in which individuals are given actual risk information, for example, as part of health risk assessments.

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